

# EVR COST ANALYSIS SPREADSHEET AS OF JUNE 18, 2002

## CHANGES TO COST ANALYSIS SINCE MARCH 29TH TECH REVIEW REPORT

**1 Corrected Equipment Costs** by replacing 0.25 with 0.88 on Summary worksheet to correct error in original cost analysis. This change increased equipment costs by a factor of 3.5 as compared to the Feb. 2000 EVR staff report.

	Present Value	
	Annualized Costs (AC)	
Year 1	(AC)	= (AC)
Year 2	(AC)(1/[1+ i])	= (AC)(0.91)
Year 3	(AC)(1/[1+ i] <sup>2</sup> )	= (AC)(0.83)
Year 4	(AC)(1/[1+ i] <sup>3</sup> )	= (AC)(0.75)

Assume 25% of stations upgrade to EVR in each year

$$\begin{aligned} \text{Total Annual Equipment cost} &= (0.25)(AC) + (0.25)(AC)(0.91) + (0.25)(AC)(0.83) + (0.25)(AC)(0.75) \\ &= (0.25)(AC) + (0.23)(AC) + (0.21)(AC) + (0.19)(AC) \\ &= (0.88)(AC) \end{aligned}$$

**2 Reduced R&D and certification costs** by halving the number of expected certified systems:

Phase I	was 14	now 7
Phase II	was 64	now 32
ISD	was 16	now 8

**4 Increased ISD "worst-case" equipment costs** based on 6/13/02 Veeder-Root e-mail

	tech rev	now
TLS-350ISD		\$3,995
Dispenser Interface	\$4,500	\$670
Pressure sensor	\$750	\$595
Flow sensor	\$900	\$885
Inventory sensor	not incl	\$1,095

	GDF1	GDF2	GDF3	GDF4	GDF5
EVR Tech Review	\$6,150	\$6,600	\$7,950	\$9,300	\$10,650
Now	\$8,883	\$9,625	\$10,656	\$11,980	\$13,308

**3 Reduced ISD installation costs** based on 4/15/02 Veeder-Root comment letter

EVR ISOR was \$1230 per dispenser  
 EVR Tech Review doubled cost to \$2560 per dispenser

Veeder-Root costs based on experience in installing ISD at nine sites (\$55/hr):  
 Two line items: Base install per facility and per-dispenser install

	Base	Per Dispenser	Example: GDF 3
New	\$250	\$125	\$250 + 3 x \$125 = \$625

Retrofit            \$300        \$200                     $\$300 + 3 \times \$200 = \$900$

The higher retrofit costs were used for the cost analysis.

**5 Revised ISD maintenance/calibration/repair costs**

EVR ISOR did not include these costs  
EVR Tech Review assumed \$1200/yr as suggested by Glenn Co. APCD

Veeder-Root suggests costs depend on number of ISD components

	Unit Cost						
A/L sensor	\$300						
Pressure sensor	\$200						
Datalogger	\$50	TOTAL					
			GDF1	GDF2	GDF3	GDF4	GDF5
			\$550	\$700	\$1,150	\$1,600	\$2,050

**6 Revised ISD emission reductions from 6.6 to 8.5 tons/day as calculated in tech review report.**

**COST-EFFECTIVENESS SUMMARY**

**Input Values Used in Cost Analysis**

Input variable used in Cost Analysis	Input value for each Model GDF				
	1	2	3	4	5
Nominal Monthly Average Sales per GDF, gals/month-GDF	13,233	37,500	75,000	150,000	300,000
Population Distribution (EPA, 1991 adjusted to fit current po	4.7%	14.1%	45.7%	31.3%	4.2%
Estimated Number of GDFs (11,250 total)	531	1,586	5,136	3,522	475
Total Annual Sales, million gals/yr	84	714	4,626	6,344	1,712
Number of Processors per GDF (when applicable)	1	1	1	1	1
Number of Drop Tubes & Spill Buckets per GDF	2.5	2.5	2.5	2.5	2.5
Wtd-Avg Number of Nozzles per GDF (EPA, 1991)	2.5	3.25	6.5	9.75	16.25
Number of Dispensers per GDF (EPA, 1991)	2	3	6	9	12

Est. population-wtd average gallons per month using popul 99,779 Total 1997 CA gasoline sales = 13,481,725,000 gals  
 Actual population-wtd average gallons per month 99,865 Total GDFs in CA in 1998 = 11,250

**Emission Reductions per Model GDF**

Module	Description	2010 ROG Reductions Statewide, tons/day	Emission Reductions by Model GDF and Module, tons/day				
			1	2	3	4	5
1	Phase I	5.0	0.03	0.26	1.72	2.35	0.64
2	Phase II	3.1	0.02	0.16	1.06	1.46	0.39
3	ORVR Compatibility	6.3	0.04	0.33	2.16	2.96	0.80
4	Liquid Retention	0.2	0.00	0.01	0.07	0.09	0.03
5	Spillage/Dripless Nozzle	3.9	0.02	0.21	1.34	1.84	0.50
6	In-Station Diagnostics	<b>8.5</b>	0.05	0.45	2.92	4.00	1.08
	Total	27.0	0.17	1.43	9.27	12.71	3.43

**Cost-Effectiveness (C.E.) & Impacts to GDFs and Consumers**

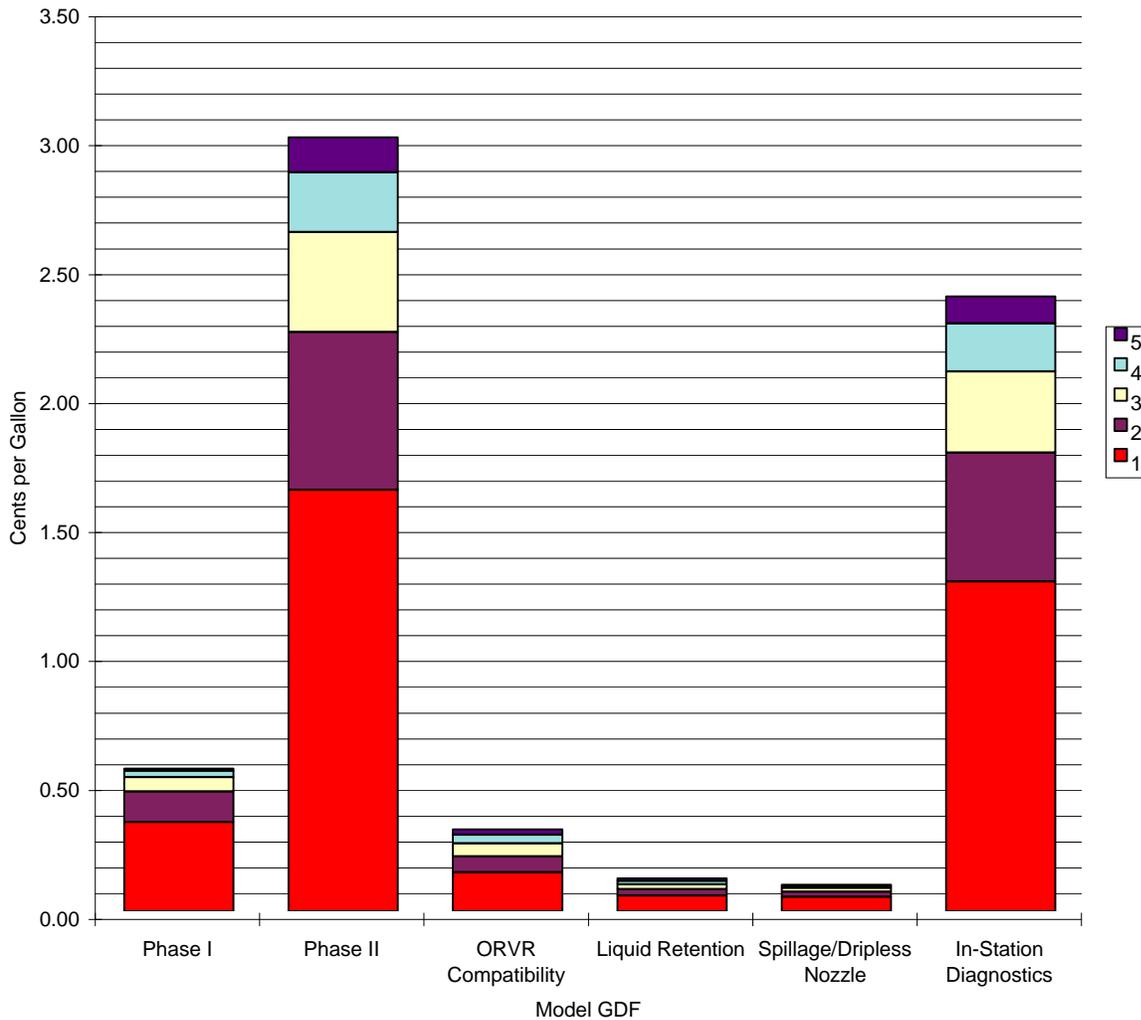
Module	Description	Cost-Effectiveness by Model GDF and Module 1999 Dollars per Pound ROG Reduced					Overall Cost-Effectiveness by Module only
		1	2	3	4	5	
1	Phase I C.E. (Annual Costs/Annual Reductions)	\$12.77	\$4.35	\$2.05	\$0.91	\$0.34	\$1.49
	Annualized Equip Costs (assumes 25%/yr conv	\$270,908.86	\$809,282.83	\$2,620,239.69	\$1,796,722.67	\$242,440.47	
	Annualized R&D Costs (assume 5% of Total R&	\$15,641.87	\$46,726.78	\$151,288.71	\$103,740.07	\$13,998.15	
	Annualized Cert & Testing (assume 5% of Total	\$10,391.81	\$31,043.32	\$100,509.90	\$68,920.57	\$9,299.79	
	Annual Gasoline Recovery Credit	(\$5,435.46)	(\$46,052.87)	(\$298,213.56)	(\$408,975.61)	(\$110,370.11)	
2	Phase II C.E. (Annual Costs/Annual Reductions)	\$97.33	\$36.44	\$23.04	\$13.87	\$8.06	\$18.00
	Annualized Equip Costs (assumes 25%/yr conv	\$1,120,673.38	\$3,621,113.67	\$15,559,187.07	\$13,298,771.89	\$2,151,227.21	
	Annualized R&D Costs (assume 50% of Total R	\$156,418.72	\$467,267.78	\$1,512,887.13	\$1,037,400.74	\$139,981.50	
	Annualized Cert & Testing (assume 50% of Total	\$103,918.06	\$310,433.18	\$1,005,098.98	\$689,205.70	\$92,997.86	
	Annual Gasoline Recovery Credit	(\$3,369.98)	(\$28,552.78)	(\$184,892.41)	(\$253,564.88)	(\$68,429.47)	
3	ORVR Compatibility (Annual Costs/Annual Reduc	\$4.41	\$1.80	\$1.48	\$0.97	\$0.62	\$1.17
	Annualized Equip Costs (assumes 25%/yr conv	\$81,712.63	\$342,102.01	\$2,215,268.25	\$2,278,544.99	\$456,764.76	
	Annualized R&D Costs (assume 10% of Total R	\$31,283.74	\$93,453.56	\$302,577.43	\$207,480.15	\$27,996.30	
	Annualized Cert & Testing (assume 10% of Total	\$20,783.61	\$62,086.64	\$201,019.80	\$137,841.14	\$18,599.57	
	Annual Gasoline Recovery Credit	(\$6,848.68)	(\$58,026.62)	(\$375,749.09)	(\$515,309.27)	(\$139,066.34)	
4	Liquid Retention (Annual Costs/Annual Reducti	\$56.08	\$22.56	\$17.53	\$11.83	\$8.98	\$14.27
	Annualized Equip Costs (assumes 25%/yr conv	\$25,391.78	\$98,608.32	\$638,534.33	\$656,773.37	\$147,702.67	
	Annualized R&D Costs (assume 5% of Total R&	\$15,641.87	\$46,726.78	\$151,288.71	\$103,740.07	\$13,998.15	
	Annualized Cert & Testing (assume 5% of Total	\$10,391.81	\$31,043.32	\$100,509.90	\$68,920.57	\$9,299.79	
	Annual Gasoline Recovery Credit	(\$217.42)	(\$1,842.11)	(\$11,928.54)	(\$16,359.02)	(\$4,414.80)	
5	Spillage/Dripless Nozzle (Annual Costs/Annual Re	\$2.65	\$0.93	\$0.67	\$0.38	\$0.23	\$0.51
	Annualized Equip Costs (assumes 25%/yr conv	\$25,391.78	\$98,608.32	\$638,534.33	\$656,773.37	\$147,702.67	
	Annualized R&D Costs (assume 5% of Total R&	\$15,641.87	\$46,726.78	\$151,288.71	\$103,740.07	\$13,998.15	
	Annualized Cert & Testing (assume 5% of Total	\$10,391.81	\$31,043.32	\$100,509.90	\$68,920.57	\$9,299.79	
	Annual Gasoline Recovery Credit	(\$4,239.66)	(\$35,921.24)	(\$232,606.58)	(\$319,000.98)	(\$86,088.69)	
6	In-Station Diagnostics (Annual Costs/Annual Redu	\$27.76	\$10.86	\$6.83	\$4.05	\$2.29	\$5.29
	Annualized Equip Costs (assumes 25%/yr conv	\$956,502.85	\$3,259,772.74	\$13,787,353.06	\$11,668,047.80	\$1,873,366.77	
	Annualized R&D Costs (assume 25% of Total R	\$78,209.36	\$233,633.89	\$756,443.56	\$518,700.37	\$69,990.75	
	Annualized Cert & Testing (assume 25% of Total	\$51,959.03	\$155,216.59	\$502,549.49	\$344,602.85	\$46,498.93	
	Annual Gasoline Recovery Credit	(\$9,240.28)	(\$78,289.88)	(\$506,963.06)	(\$695,258.55)	(\$187,629.19)	
	Total Annual Costs by Model GDF Category	\$2,971,903.34	\$9,536,204.32	\$38,884,735.70	\$31,600,378.65	\$4,889,164.66	\$87,882,387
	Total Annual Costs per each GDF in a Model GDF	<b>\$5,596.80</b>	<b>\$6,011.79</b>	<b>\$7,571.24</b>	<b>\$8,973.05</b>	<b>\$10,288.65</b>	overall annual cost
	Per-gallon cost increase for consumers, cents/gall	<b>3.52</b>	<b>1.33</b>	<b>0.84</b>	<b>0.50</b>	<b>0.29</b>	<b>0.65</b>
	Non-Wtd Cost-Effectiveness for All Modules by Mo	\$24.11	\$9.13	\$5.75	\$3.41	\$1.95	vg. per-gal increas (cents per gallon)

Notes:  
 Gasoline price/gal assu \$1.50  
 Per-gallon increase for consumers assumes all costs passed on to consumers  
 Gasoline density, lb/gal 6.3

**Per-Gallon Cost Increase by Module and Model GDF**

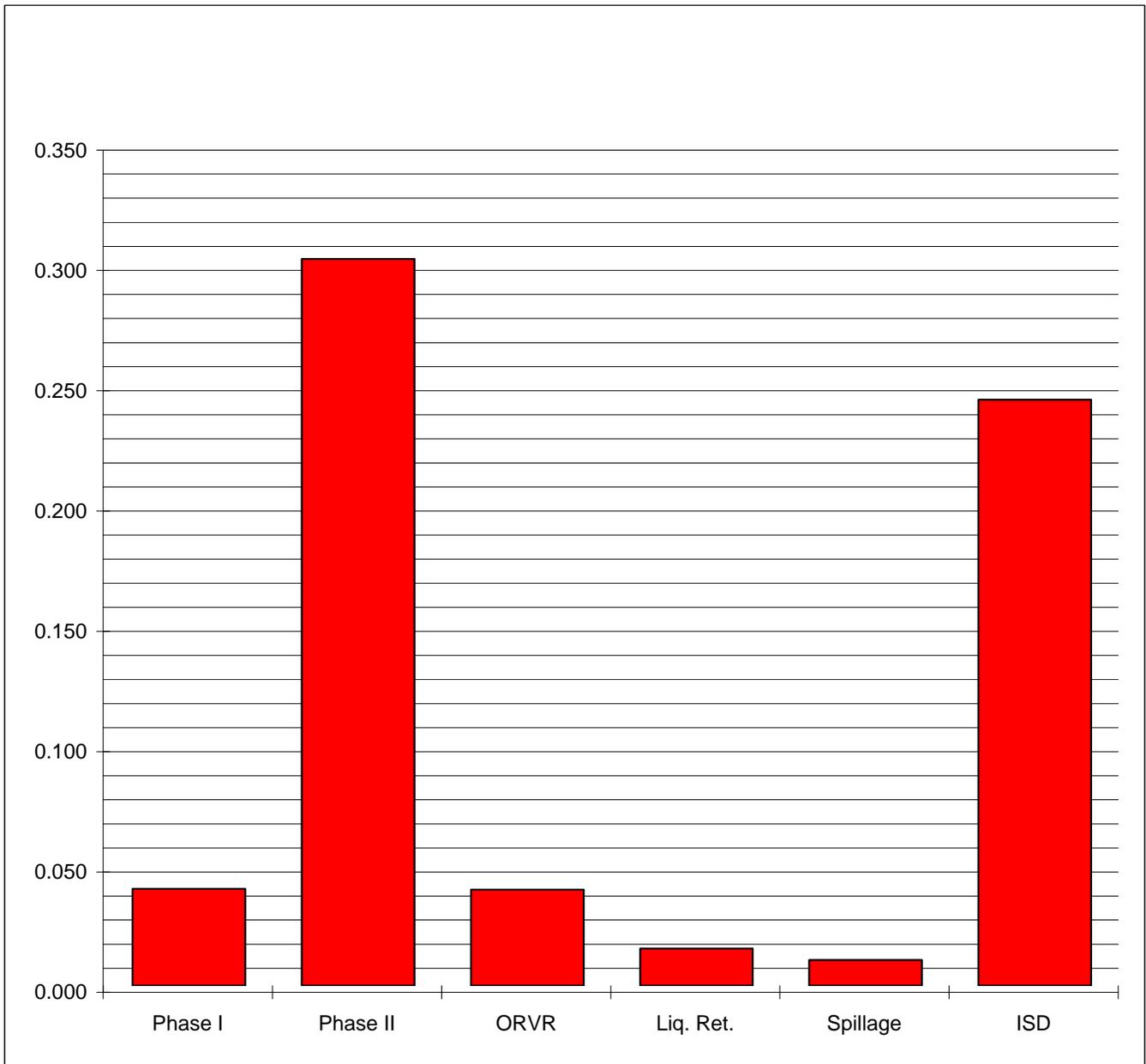
		Per-Gallon Cost Increase by Module and Model GDF, cents per gallon				
Model GDF		1	2	3	4	5
Module	Per-GDF Throughput, c	13,233	37,500	75,000	150,000	300,000
1	Phase I	0.35	0.12	0.06	0.02	0.01
2	Phase II	1.63	0.61	0.39	0.23	0.14
3	ORVR Compatibility	0.15	0.06	0.05	0.03	0.02
4	Liquid Retention	0.06	0.02	0.02	0.01	0.01
5	Spillage/Dripleless Nozzle	0.06	0.02	0.01	0.01	0.00
6	In-Station Diagnostics	1.28	0.50	0.31	0.19	0.11
Total Cents per Gal Increase by		3.52	1.33	0.84	0.50	0.29

Fig. VI-2  
Per-Gallon Increase per Model GDF



**Per-Gallon Cost Increase by Module**

Module	Description	Annual Costs, \$Million/yr	Cents per Gallon
1	Phase I	\$5.4	0.040
2	Phase II	\$40.7	0.302
3	ORVR	\$5.4	0.040
4	Liq. Ret.	\$2.1	0.015
5	Spillage	\$1.4	0.011
6	ISD	\$32.8	0.243
	Total	\$87.9	0.652



### Estimated Equipment Costs for a Model GDF 1 Facility per Proposed Module

Proposed Module	Unit Cost 1999 Dollars	Number of Components in Model GDF				
		Bal-1	Bal-2	Hybrid	Assist-1	Assist-2
<b>Module 1 (Phase I)</b>						
Phase I Components						
Pressure/Vacuum (P/V) valve	\$65	2.5	2.5	2.5	2.5	2.5
Low-emission spill containment and cov	\$351	2.5	2.5	2.5	2.5	2.5
Drop tube & overflow protection	\$178	2.5	2.5	2.5	2.5	2.5
Rotatable adaptor	\$55	2.5	2.5	2.5	2.5	2.5
Installation Costs						
Pressure/Vacuum (P/V) Valve	\$80	2.5	2.5	2.5	2.5	2.5
Low-emission spill containment and cov	\$160	2.5	2.5	2.5	2.5	2.5
Drop tube & overflow protection	\$160	2.5	2.5	2.5	2.5	2.5
Rotatable adaptor	\$80	2.5	2.5	2.5	2.5	2.5
<b>Module 1 -- Total Fixed Cost (All Equipment)</b>		<b>\$2,823</b>	<b>\$2,823</b>	<b>\$2,823</b>	<b>\$2,823</b>	<b>\$2,823</b>
<b>Module 1 -- Total Annualized Cost = Total Fixed Cost x CRF</b>		<b>\$580</b>	<b>\$580</b>	<b>\$580</b>	<b>\$580</b>	<b>\$580</b>
		Avg Fixed	<b>\$2,823</b>	Avg Annual		<b>\$580</b>

### **Module 2 (Phase II w/pressure-related fugitives)**

Dispenser Components						
Nozzle -- Balance	\$200	2.5	2.5			
Nozzle -- Hybrid	\$231			2.5		
Nozzle -- Assist Type 1	\$209				2.5	
Nozzle -- Assist Type 2	\$225					2.5
Modified Equipment (Dispenser-related)	\$382	2.5	2.5			
Modified Equipment (Dispenser-related)	\$468			2.5		
Modified Equipment (Dispenser-related)	\$400				2.5	

Modified Equipment (Dispenser-related)	\$220						2.5
Auxilliary Items (incl. P/V, collection & processor)							
Assist Type 1	\$7,500					1.0	
Assist Type 2	\$9,000						1.0
Vapor processor							
for those Balance systems that use processor	\$7,500		1.0	1.0	1.0		
Installation Costs		old					
Nozzle -- Balance	\$172	\$86	2.5	2.5			
Nozzle -- Hybrid	\$215	\$108			2.5		
Nozzle -- Assist Type 1	\$97	\$48				2.5	
Nozzle -- Assist Type 2	\$108	\$54					2.5
Modified Equipment (Dispenser-related)	\$344	\$172	2.5	2.5			
Modified Equipment (Dispenser-related)	\$430	\$215			2.5		
Modified Equipment (Dispenser-related)	\$194	\$97				2.5	
Modified Equipment (Dispenser-related)	\$215	\$108					2.5
Auxilliary Items -- Assist Type 1	\$3,012	\$1,506				1.0	
Auxilliary Items -- Assist Type 2	\$2,581	\$1,291					1.0
Vapor processor -- Balance	\$3,012	\$1,506	1.0	1.0	1.0		
<b>Module 2 -- Total Fixed Cost (All Equipment)</b>			\$13,257	\$13,257	\$13,873	\$12,760	\$13,501
Module 2 -- Total Fixed Cost (TFC Nozzles)			\$715	\$715	\$847	\$643	\$696
Module 2 -- Total Fixed Cost (TFC Dispensers)			\$1,385	\$1,385	\$1,707	\$1,242	\$820
Module 2 -- Total Fixed Cost (TFC All Other Equipment)			\$11,157	\$11,157	\$11,319	\$10,875	\$11,985
Module 2 -- Annualized Cost = Fixed Costs (TFC Nozzles) x			\$288	\$288	\$341	\$259	\$280
Module 2 -- Annualized Cost = Fixed Costs (TFC Dispensers) x			\$284	\$284	\$351	\$255	\$168
Module 2 -- Annualized Cost = Fixed Cost (TFC All Others) x			\$1,816	\$1,816	\$1,842	\$1,770	\$1,950
<b>Module 2 -- Total Annualized Costs (All Equipment)</b>			\$2,388	\$2,388	\$2,533	\$2,284	\$2,399
			Avg Fixed	\$13,330	Avg Annual		\$2,398

**Module 3 (ORVR Compatibility)**

<b>Components</b>					
Nozzle (Healy ORVR compatible drop-in)	\$54			2.5	2.5
Assumed 25% premium over Module 2-compliant nozzle (applies to assist only)					
Dispenser sensor & related electronics (Hoffer Flow Control)	\$200	2.0	2.0	2.0	
<b>Installation Costs</b>					
Nozzle (Healy ORVR compatible drop-in)	\$160			2.5	2.5
Dispenser sensor & related electronics	\$160	2.0	2.0	2.0	
<b>Module 3 -- Total Fixed Costs (Equipment Purchase + Installation)</b>	<b>\$720</b>	<b>\$720</b>	<b>\$720</b>	<b>\$536</b>	<b>\$536</b>
Module 3 -- Total Fixed Costs (Nozzles)	\$0	\$0	\$0	\$536	\$536
Module 3 -- Total Fixed Costs (Dispensers)	\$720	\$720	\$720	\$0	\$0
Module 3 -- Annualized Costs = Fixed Costs (Nozzles) x CRF	\$0	\$0	\$0	\$215	\$215
Module 3 -- Annualized Costs = Fixed Costs (Dispensers) x CRF	\$148	\$148	\$148	\$0	\$0
<b>Module 3 -- Total Annualized Costs (All Equipment)</b>	<b>\$148</b>	<b>\$148</b>	<b>\$148</b>	<b>\$215</b>	<b>\$215</b>
<b>Avg Fixed</b>		<b>\$646</b>		<b>Avg Annual</b>	<b>\$175</b>

**Module 4 (Liquid Retention -- Redesigned Nozzle)**

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	\$54	2.5	2.5	2.5	2.5
<b>Module 4 -- Total Fixed Costs (Equipment Purchase + Installation)</b>	<b>\$135</b>	<b>\$135</b>	<b>\$135</b>	<b>\$135</b>	<b>\$135</b>
<b>Module 4 -- Annualized Costs = Fixed Costs x CRF</b>	<b>\$54</b>	<b>\$54</b>	<b>\$54</b>	<b>\$54</b>	<b>\$54</b>
<b>Avg Fixed</b>		<b>\$135</b>		<b>Avg Annual</b>	<b>\$54</b>

**Module 5 (Spillage, including Dripless Nozzle)**

Assumed 25% premium over Module 2- nozzle; in-nozzle design only; no extra installation	\$54	2.5	2.5	2.5	2.5	2.5
<b>Module 5 -- Total Fixed Costs (All Equipment)</b>	\$135	\$135	\$135	\$135	\$135	\$135
<b>Module 5 -- Annualized Costs = Fixed Costs x CRF3</b>	\$54	\$54	\$54	\$54	\$54	\$54
	Avg Fixed	\$135	Avg Annual	\$54		

**Module 6 (In-Station Diagnostics)**

Components (Veeder-Root Cost Estimates)	(OLD)					
Sensors -- Pressure	\$595	\$192	1.0	1.0	1.0	1.0
Sensors -- A/L	\$885	\$245	1.0	1.0	1.0	1.0
Datalogger w/EEPROM & new CPU/moth	\$3,995	\$1,197	1.0	1.0	1.0	1.0
Dispenser interface	\$670		1.0	1.0	1.0	1.0
Inventory sensor (ATG)	\$1,095		2.5	2.5	2.5	2.5
<b>Installation Costs: assume retrofit costs of \$300 base + \$200 per dispenser</b>	\$500	\$1,280	1.0	1.0	1.0	1.0
<b>Module 6 -- Total Fixed Costs (All Equipment)</b>	\$9,383	\$9,383	\$9,383	\$9,383	\$9,383	\$9,383
<b>Module 6 -- Annualized Costs = Total Fixed Costs x CRF1</b>	\$1,527	\$1,527	\$1,527	\$1,527	\$1,527	\$1,527
<b>Module 6 - Annualized maintenance/calib/repair</b>	\$520	\$520	\$520	\$520	\$520	\$520
	Avg Fixed	\$9,383	Avg Annual	\$2,047		

<b>Total Fixed Costs (All Modules)</b>	\$26,452	\$26,452	\$27,068	\$25,771	\$26,512
<b>Total Annualized Fixed Costs (All Modules)</b>	\$4,751	\$4,751	\$4,897	\$4,714	\$4,830

Average Total Fixed Cost	\$26,451
Average Total Annualized Cost	\$4,789

**Notes**

Cost Recovery Factor CRF1 (10% discount, 10 yr. life) -- All Others

Cost Recovery Factor CRF2 (10% discount, 7 yr. life) -- Dispensers

Cost Recovery Factor CRF3 (10% discount, 3 yr. life) -- Nozzles

\* from Healy Systems, 1999.

0.1627
0.2054
0.4021

**Estimated Equipment Costs for a Model GDF 2 Facility per Proposed Module**

Proposed Module	Unit Cost 1999 Dollars	Number of Components in Model GDF					
		Bal-1	Bal-2	Hybrid	Assist-1	Assist-2	
<b>Module 1 (Phase I)</b>							
Phase I Components							
Pressure/Vacuum (P/V) valve	\$65	2.5	2.5	2.5	2.5	2.5	
Low-emission spill containment and cover	\$351	2.5	2.5	2.5	2.5	2.5	
Drop tube & overfill protection	\$178	2.5	2.5	2.5	2.5	2.5	
Rotatable adaptor	\$55	2.5	2.5	2.5	2.5	2.5	
Installation Costs							
Pressure/Vacuum (P/V) Valve	\$80	2.5	2.5	2.5	2.5	2.5	
Low-emission spill containment and cover	\$160	2.5	2.5	2.5	2.5	2.5	
Drop tube & overfill protection	\$160	2.5	2.5	2.5	2.5	2.5	
Rotatable adaptor	\$80	2.5	2.5	2.5	2.5	2.5	
<b>Module 1 -- Total Fixed Cost (All Equipment)</b>			\$2,823	\$2,823	\$2,823	\$2,823	\$2,823
<b>Module 1 -- Total Annualized Cost = Total Fixed Cost x CRF2</b>			\$580	\$580	\$580	\$580	\$580
		Avg Fixed	\$2,823	Avg Annual		\$580	
<b>Module 2 (Phase II w/pressure-related fugitives)</b>							
Dispenser Components							
Nozzle -- Balance	\$200	3.25	3.25				
Nozzle -- Hybrid	\$231			3.25			
Nozzle -- Assist Type 1	\$209				3.25		
Nozzle -- Assist Type 2	\$225					3.25	
Modified Equipment (Dispenser-related) -- Balance	\$382	3.25	3.25				
Modified Equipment (Dispenser-related) -- Hybrid	\$468			3.25			
Modified Equipment (Dispenser-related) -- Assist Ty	\$400				3.25		
Modified Equipment (Dispenser-related) -- Assist Ty	\$220					3.25	
Auxilliary Items (incl. P/V, collection & processor)							
Assist Type 1	\$7,500				1.00		
Assist Type 2	\$9,000					1.00	

Vapor processor							
for those Balance systems that use processors	\$7,500		1.00	1.00	1.00		
Installation Costs		OLD					
Nozzle -- Balance	\$172	\$86	3.25	3.25			
Nozzle -- Hybrid	\$215	\$108			3.25		
Nozzle -- Assist Type 1	\$97	\$48				3.25	
Nozzle -- Assist Type 2	\$108	\$54					3.25
Modified Equipment (Dispenser-related) -- Balance	\$344	\$172	3.25	3.25			
Modified Equipment (Dispenser-related) -- Hybrid	\$430	\$215			3.25		
Modified Equipment (Dispenser-related) -- Assist Type 1	\$194	\$97				3.25	
Modified Equipment (Dispenser-related) -- Assist Type 2	\$215	\$108					3.25
Auxilliary Items -- Assist Type 1	\$3,012	\$1,506				1.00	
Auxilliary Items -- Assist Type 2	\$2,581	\$1,291					1.00
Vapor processor -- Balance	\$3,012	\$1,506	1.00	1.00	1.00		
<b>Module 2 -- Total Fixed Cost (All Equipment)</b>			\$14,081	\$14,081	\$14,882	\$13,434	\$14,077
Module 2 -- Total Fixed Cost (TFC Nozzles)			\$930	\$930	\$1,101	\$836	\$905
Module 2 -- Total Fixed Cost (TFC Dispensers)			\$1,800	\$1,800	\$2,220	\$1,615	\$1,066
Module 2 -- Total Fixed Cost (TFC All Other Equipment)			\$11,351	\$11,351	\$11,561	\$10,983	\$12,106
Module 2 -- Annualized Cost = Fixed Costs (TFC Nozzles) x CRF3			\$374	\$374	\$443	\$336	\$364
Module 2 -- Annualized Cost = Fixed Costs (TFC Dispensers) x CRF2			\$370	\$370	\$456	\$332	\$219
Module 2 -- Annualized Cost = Fixed Cost (TFC All Others) x CRF1			\$1,847	\$1,847	\$1,881	\$1,788	\$1,970
<b>Module 2 -- Total Annualized Costs (All Equipment)</b>			\$2,591	\$2,591	\$2,780	\$2,455	\$2,553
			<b>Avg Fixed</b>	<b>\$14,111</b>	<b>Avg Annual</b>		<b>\$2,594</b>

**Module 3 (ORVR Compatibility)**

Components						
Nozzle (Healy ORVR compatible drop-in assist nozz Assumed 25% premium over Module 2-compliant nozzle (applies to assist only)	\$54				3.25	3.25
Dispenser sensor & related electronics (Hoffer Flow Control)	\$200	3.00	3.00	3.00		
Installation Costs						
Nozzle (Healy ORVR compatible drop-in assist nozz	\$160				3.25	3.25
Dispenser sensor & related electronics	\$160	3.00	3.00	3.00		
<b>Module 3 -- Total Fixed Costs (Equipment Purchase + Installation)</b>		<b>\$1,080</b>	<b>\$1,080</b>	<b>\$1,080</b>	<b>\$696</b>	<b>\$696</b>
Module 3 -- Total Fixed Costs (Nozzles)		\$0	\$0	\$0	\$696	\$696
Module 3 -- Total Fixed Costs (Dispensers)		\$1,080	\$1,080	\$1,080	\$0	\$0
Module 3 -- Annualized Costs = Fixed Costs (Nozzles) x CRF3		\$0	\$0	\$0	\$280	\$280
Module 3 -- Annualized Costs = Fixed Costs (Dispensers) x CRF2		\$222	\$222	\$222	\$0	\$0
<b>Module 3 -- Total Annualized Costs (All Equipment)</b>		<b>\$222</b>	<b>\$222</b>	<b>\$222</b>	<b>\$280</b>	<b>\$280</b>
		Avg Fixed	\$926	Avg Annual		\$245

**Module 4 (Liquid Retention -- Redesigned Nozzle)**

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	\$54	3.25	3.25	3.25	3.25	3.25
<b>Module 4 -- Total Fixed Costs (Equipment Purchase + Installation)</b>		<b>\$176</b>	<b>\$176</b>	<b>\$176</b>	<b>\$176</b>	<b>\$176</b>
Module 4 -- Annualized Costs = Fixed Costs x CRF3		\$71	\$71	\$71	\$71	\$71
		Avg Fixed	\$176	Avg Annual		\$71

**Module 5 (Spillage, including Dripless Nozzle)**

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	\$54	3.25	3.25	3.25	3.25	3.25
<b>Module 5 -- Total Fixed Costs (All Equipment)</b>		<b>\$176</b>	<b>\$176</b>	<b>\$176</b>	<b>\$176</b>	<b>\$176</b>
Module 5 -- Annualized Costs = Fixed Costs x CRF3		\$71	\$71	\$71	\$71	\$71
		Avg Fixed	\$176	Avg Annual		\$71

**Module 6 (In-Station Diagnostics)**

Components		(OLD)						
Sensors -- Pressure	\$595	\$192	1.0	1.0	1.0	1.0	1.0	1.0
Sensors -- A/L	\$885	\$245	1.5	1.5	1.5	1.5	1.5	1.5
Datalogger w/EPROM & new CPU/motherboard	\$3,995	\$1,197	1.0	1.0	1.0	1.0	1.0	1.0
Dispenser interface	\$670		1.0	1.0	1.0	1.0	1.0	1.0
Inventory sensor (ATG)	\$1,095		2.5	2.5	2.5	2.5	2.5	2.5
Installation Costs: assume retrofit costs of \$300 base + \$200 per dispenser								
	\$600	\$1,280	1.5	1.5	1.5	1.5	1.5	1.5
<b>Module 6 -- Total Fixed Costs (All Equipment)</b>			\$9,925	\$9,925	\$9,925	\$9,925	\$9,925	\$9,925
Module 6 -- Annualized Costs = Total Fixed Costs x CRF1			\$1,615	\$1,615	\$1,615	\$1,615	\$1,615	\$1,615
Module 6 - Annualized maintenance/calib/repair			\$720	\$720	\$720	\$720	\$720	\$720
Avg Fixed			\$9,925	Avg Annual			\$2,335	

<b>Total Fixed Costs (All Modules)</b>	\$28,260	\$28,260	\$29,060	\$27,229	\$27,872
<b>Total Annualized Fixed Costs (All Modules)</b>	\$5,149	\$5,149	\$5,338	\$5,072	\$5,169

Notes

Cost Recovery Factor CRF1 (10% discount, 10 yr. life)	0.1627
Cost Recovery Factor CRF2 (10% discount, 7 yr. life)	0.2054
Cost Recovery Factor CRF3 (10% discount, 3 yr. life)	0.4021

Average Total Fixed Cost	\$28,136
Average Total Annualized Cost	\$5,175

\* from Healy Systems, 1999.

**Estimated Equipment Costs for a Model GDF 3 Facility per Proposed Module**

Proposed Module	Unit Cost 1999 Dollars	Number of Components in Model GDF														
		Bal-1	Bal-2	Hybrid	Assist-1	Assist-2										
<b>Module 1 (Phase I)</b>																
Phase I Components																
Pressure/Vacuum (P/V) valve	\$65	2.5	2.5	2.5	2.5	2.5										
Low-emission spill containment and cover	\$351	2.5	2.5	2.5	2.5	2.5										
Drop tube & overfill protection	\$178	2.5	2.5	2.5	2.5	2.5										
Rotatable adaptor	\$55	2.5	2.5	2.5	2.5	2.5										
Installation Costs																
Pressure/Vacuum (P/V) Valve	\$80	2.5	2.5	2.5	2.5	2.5										
Low-emission spill containment and cover	\$160	2.5	2.5	2.5	2.5	2.5										
Drop tube & overfill protection	\$160	2.5	2.5	2.5	2.5	2.5										
Rotatable adaptor	\$80	2.5	2.5	2.5	2.5	2.5										
<b>Module 1 -- Total Fixed Cost (All Equipment)</b>		<table border="1"> <tr> <td>\$2,823</td> <td>\$2,823</td> <td>\$2,823</td> <td>\$2,823</td> <td>\$2,823</td> </tr> </table>					\$2,823	\$2,823	\$2,823	\$2,823	\$2,823					
\$2,823	\$2,823	\$2,823	\$2,823	\$2,823												
<b>Module 1 -- Total Annualized Cost = Total Fixed Cost x CRF2</b>		<table border="1"> <tr> <td>\$580</td> <td>\$580</td> <td>\$580</td> <td>\$580</td> <td>\$580</td> </tr> <tr> <td>Avg Fixed</td> <td>\$2,823</td> <td colspan="2">Avg Annual</td> <td>\$580</td> </tr> </table>					\$580	\$580	\$580	\$580	\$580	Avg Fixed	\$2,823	Avg Annual		\$580
\$580	\$580	\$580	\$580	\$580												
Avg Fixed	\$2,823	Avg Annual		\$580												
<b>Module 2 (Phase II w/pressure-related fugitives)</b>																
Dispenser Components																
Nozzle -- Balance	\$200	6.5	6.5													
Nozzle -- Hybrid	\$231			6.5												
Nozzle -- Assist Type 1	\$209				6.5											
Nozzle -- Assist Type 2	\$225					6.5										
Modified Equipment (Dispenser-related) -- Balance	\$382	6.5	6.5													
Modified Equipment (Dispenser-related) -- Hybrid	\$468			6.5												
Modified Equipment (Dispenser-related) -- Assist Type 1	\$400				6.5											
Modified Equipment (Dispenser-related) -- Assist Type 2	\$220					6.5										
Auxilliary Items (incl. P/V, collection & processor)																
Assist Type 1	\$7,500				1.0											
Assist Type 2	\$9,000					1.0										
Vapor processor for those Balance systems that use processors	\$7,500	1.0	1.0	1.0												
Installation Costs																

Nozzle -- Balance	\$86	\$172	6.5	6.5			
Nozzle -- Hybrid	\$108	\$215			6.5		
Nozzle -- Assist Type 1	\$48	\$97				6.5	
Nozzle -- Assist Type 2	\$54	\$108					6.5
Modified Equipment (Dispenser-related) -- Balan	\$172	\$344	6.5	6.5			
Modified Equipment (Dispenser-related) -- Hybrid	\$215	\$430			6.5		
Modified Equipment (Dispenser-related) -- Assis	\$97	\$194				6.5	
Modified Equipment (Dispenser-related) -- Assis	\$108	\$215					6.5
Auxilliary Items -- Assist Type 1	\$1,506	\$3,012				1.0	
Auxilliary Items -- Assist Type 2	\$1,291	\$2,581					1.0
Vapor processor -- Balance	\$1,506	\$3,012	1.0	1.0	1.0		
<b>Module 2 -- Total Fixed Cost (All Equipment)</b>			\$17,649	\$17,649	\$19,251	\$16,357	\$16,573
Module 2 -- Total Fixed Cost (TFC Nozzles)			\$1,859	\$1,859	\$2,202	\$1,672	\$1,811
Module 2 -- Total Fixed Cost (TFC Dispensers)			\$3,600	\$3,600	\$4,439	\$3,230	\$2,132
Module 2 -- Total Fixed Cost (TFC All Other Equipment)			\$12,190	\$12,190	\$12,609	\$11,455	\$12,630
Module 2 -- Annualized Cost = Fixed Costs (TFC Nozzles) x CRF3			\$748	\$748	\$886	\$672	\$728
Module 2 -- Annualized Cost = Fixed Costs (TFC Dispensers) x CRF2			\$740	\$740	\$912	\$663	\$438
Module 2 -- Annualized Cost = Fixed Cost (TFC All Others) x CRF1			\$1,984	\$1,984	\$2,052	\$1,864	\$2,055
<b>Module 2 -- Total Annualized Costs (All Equipment)</b>			<b>\$3,471</b>	<b>\$3,471</b>	<b>\$3,850</b>	<b>\$3,200</b>	<b>\$3,222</b>
			<b>Avg Fixed</b>	<b>\$17,496</b>	<b>Avg Annual</b>		<b>\$3,443</b>

**Module 3 (ORVR Compatibility)**

<b>Components</b>						
Nozzle (Healy ORVR compatible drop-in assist nozzle) Assumed 25% premium over Module 2-compliant nozzle (applies to assist only)	\$54				6.5	6.5
Dispenser sensor & related electronics (Hoffer Flow Control)	\$200	6.0	6.0	6.0		
<b>Installation Costs</b>						
Nozzle (Healy ORVR compatible drop-in assist nozzle)*	\$160				6.5	6.5
Dispenser sensor & related electronics	\$160	6.0	6.0	6.0		
<b>Module 3 -- Total Fixed Costs (Equipment Purchase + Installation)</b>		<b>\$2,160</b>	<b>\$2,160</b>	<b>\$2,160</b>	<b>\$1,392</b>	<b>\$1,392</b>
Module 3 -- Total Fixed Costs (Nozzles)		\$0	\$0	\$0	\$1,392	\$1,392
Module 3 -- Total Fixed Costs (Dispensers)		\$2,160	\$2,160	\$2,160	\$0	\$0
Module 3 -- Annualized Costs = Fixed Costs (Nozzles) x CRF3		\$0	\$0	\$0	\$560	\$560
Module 3 -- Annualized Costs = Fixed Costs (Dispensers) x CRF2		\$444	\$444	\$444	\$0	\$0
<b>Module 3 -- Total Annualized Costs (All Equipment)</b>		<b>\$444</b>	<b>\$444</b>	<b>\$444</b>	<b>\$560</b>	<b>\$560</b>
		<b>Avg Fixed</b>	<b>\$1,853</b>	<b>Avg Annual</b>		<b>\$490</b>

**Module 4 (Liquid Retention -- Redesigned Nozzle)**

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	\$54	6.5	6.5	6.5	6.5	6.5
<b>Module 4 -- Total Fixed Costs (Equipment Purchase + Installation)</b>		<b>\$351</b>	<b>\$351</b>	<b>\$351</b>	<b>\$351</b>	<b>\$351</b>
Module 4 -- Annualized Costs = Fixed Costs x CRF3		\$141	\$141	\$141	\$141	\$141
		<b>Avg Fixed</b>	<b>\$351</b>	<b>Avg Annual</b>		<b>\$141</b>

**Module 5 (Spillage, including Dripless Nozzle)**

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	\$54	6.5	6.5	6.5	6.5	6.5
<b>Module 5 -- Total Fixed Costs (All Equipment)</b>		<b>\$351</b>	<b>\$351</b>	<b>\$351</b>	<b>\$351</b>	<b>\$351</b>
Module 5 -- Annualized Costs = Fixed Costs x CRF3		\$141	\$141	\$141	\$141	\$141
		<b>Avg Fixed</b>	<b>\$351</b>	<b>Avg Annual</b>		<b>\$141</b>

**Module 6 (In-Station Diagnostics)**

Components	(OLD)							
Sensors -- Pressure	\$192	\$595	1.0	1.0	1.0	1.0	1.0	1.0
Sensors -- A/L	\$245	\$885	3.0	3.0	3.0	3.0	3.0	3.0
Datalogger w/EPROM & new CPU/motherboard	\$1,197	\$3,995	1.0	1.0	1.0	1.0	1.0	1.0
Dispenser interface		\$670	1.0	1.0	1.0	1.0	1.0	1.0
Inventory sensor (ATG)		\$1,095	2.5	2.5	2.5	2.5	2.5	2.5
<b>Installation Costs: assume retrofit costs of \$300 base + \$200 per dispenser</b>								
		\$900	3.0	3.0	3.0	3.0	3.0	3.0
<b>Module 6 -- Total Fixed Costs (All Equipment)</b>			\$11,556	\$11,556	\$11,556	\$11,556	\$11,556	\$11,556
<b>Module 6 -- Annualized Costs = Total Fixed Costs x CRF1</b>			\$1,881	\$1,881	\$1,881	\$1,881	\$1,881	\$1,881
<b>Module 6 - Annualized maintenance/calib/repair</b>			\$1,170	\$1,170	\$1,170	\$1,170	\$1,170	\$1,170
			Avg Fixed	\$11,556	Avg Annual		\$3,051	

<b>Total Fixed Costs (All Modules)</b>	\$34,890	\$34,890	\$36,492	\$32,830	\$33,046
<b>Total Annualized Fixed Costs (All Modules)</b>	\$6,658	\$6,658	\$7,036	\$6,503	\$6,524

Notes

Cost Recovery Factor CRF1 (10% discount, 10 yr. life) -- All 

0.1627
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 Cost Recovery Factor CRF2 (10% discount, 7 yr. life) -- Disp 

0.2054
--------

  
 Cost Recovery Factor CRF3 (10% discount, 3 yr. life) -- Noz 

0.4021
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\* from Healy Systems, 1999.

<b>Average Total Fixed Cost</b>	\$34,430
<b>Average Total Annualized Cost</b>	\$6,676

**Estimated Equipment Costs for a Model GDF 4 Facility per Proposed Module**

Proposed Module	Unit Cost 1999 Dollars	Number of Components in Model GDF					
		Bal-1	Bal-2	Hybrid	Assist-1	Assist-2	
<b>Module 1 (Phase I)</b>							
Phase I Components							
Pressure/Vacuum (P/V) valve	\$65	2.5	2.5	2.5	2.5	2.5	
Low-emission spill containment and cover	\$351	2.5	2.5	2.5	2.5	2.5	
Drop tube & overfill protection	\$178	2.5	2.5	2.5	2.5	2.5	
Rotatable adaptor	\$55	2.5	2.5	2.5	2.5	2.5	
Installation Costs							
Pressure/Vacuum (P/V) Valve	\$80	2.5	2.5	2.5	2.5	2.5	
Low-emission spill containment and cover	\$160	2.5	2.5	2.5	2.5	2.5	
Drop tube & overfill protection	\$160	2.5	2.5	2.5	2.5	2.5	
Rotatable adaptor	\$80	2.5	2.5	2.5	2.5	2.5	
<b>Module 1 -- Total Fixed Cost (All Equipment)</b>			<b>\$2,823</b>	<b>\$2,823</b>	<b>\$2,823</b>	<b>\$2,823</b>	<b>\$2,823</b>
<b>Module 1 -- Total Annualized Cost = Total Fixed Cost x CRF2</b>			<b>\$580</b>	<b>\$580</b>	<b>\$580</b>	<b>\$580</b>	<b>\$580</b>
			<b>Avg Fixed</b>	<b>\$2,823</b>	<b>Avg Annual</b>		<b>\$580</b>
<b>Module 2 (Phase II w/pressure-related fugitives)</b>							
Dispenser Components							
Nozzle -- Balance	\$200	9.8	9.75				
Nozzle -- Hybrid	\$231			9.75			
Nozzle -- Assist Type 1	\$209				9.75		
Nozzle -- Assist Type 2	\$225					9.75	
Modified Equipment (Dispenser-related) -- Balance	\$382	9.75	9.75				
Modified Equipment (Dispenser-related) -- Hybrid	\$468			9.75			
Modified Equipment (Dispenser-related) -- Assist Type	\$400				9.75		
Modified Equipment (Dispenser-related) -- Assist Type	\$220					9.75	
Auxilliary Items (incl. P/V, collection & processor)							
Assist Type 1	\$7,500				1.00		
Assist Type 2	\$9,000					1.00	
Vapor processor							
for those Balance systems that use processors	\$7,500	1.00	1.00	1.00			

Installation Costs		(OLD)					
Nozzle -- Balance	\$172	\$86	9.75	9.75			
Nozzle -- Hybrid	\$215	\$108			9.75		
Nozzle -- Assist Type 1	\$97	\$48				9.75	
Nozzle -- Assist Type 2	\$108	\$54					9.75
Modified Equipment (Dispenser-related) -- Balance	\$344	\$172	9.75	9.75			
Modified Equipment (Dispenser-related) -- Hybrid	\$430	\$215			9.75		
Modified Equipment (Dispenser-related) -- Assist Type 1	\$194	\$97				9.75	
Modified Equipment (Dispenser-related) -- Assist Type 2	\$215	\$108					9.75
Auxilliary Items -- Assist Type 1	\$3,012	\$1,506				1.00	
Auxilliary Items -- Assist Type 2	\$2,581	\$1,291					1.00
Vapor processor -- Balance	\$3,012	\$1,506	1.00	1.00	1.00		
<b>Module 2 -- Total Fixed Cost (All Equipment)</b>			\$21,218	\$21,218	\$23,621	\$19,280	\$19,069
Module 2 -- Total Fixed Cost (TFC Nozzles)			\$2,789	\$2,789	\$3,303	\$2,508	\$2,716
Module 2 -- Total Fixed Cost (TFC Dispensers)			\$5,401	\$5,401	\$6,659	\$4,845	\$3,198
Module 2 -- Total Fixed Cost (TFC All Other Equipment)			\$13,029	\$13,029	\$13,658	\$11,927	\$13,154
Module 2 -- Annualized Cost = Fixed Costs (TFC Nozzles) x CRF3			\$1,121	\$1,121	\$1,328	\$1,009	\$1,092
Module 2 -- Annualized Cost = Fixed Costs (TFC Dispensers) x CRF2			\$1,109	\$1,109	\$1,368	\$995	\$657
Module 2 -- Annualized Cost = Fixed Cost (TFC All Others) x CRF1			\$2,120	\$2,120	\$2,223	\$1,941	\$2,141
<b>Module 2 -- Total Annualized Costs (All Equipment)</b>			\$4,351	\$4,351	\$4,919	\$3,945	\$3,890
			Avg Fixed	\$20,881	Avg Annual		\$4,291

**Module 3 (ORVR Compatibility)**

Components						
Nozzle (Healy ORVR compatible drop-in assist nozzle Assumed 25% premium over Module 2-compliant nozzle (applies to assist only)	\$54				9.8	9.8
Dispenser sensor & related electronics (Hoffer Flow Control)	\$200	9.0	9.0	9.0		
Installation Costs						
Nozzle (Healy ORVR compatible drop-in assist nozzle)	\$160				9.8	9.8
Dispenser sensor & related electronics	\$160	9.0	9.0	9.0		
<b>Module 3 -- Total Fixed Costs (Equipment Purchase + Installation)</b>		<b>\$3,240</b>	<b>\$3,240</b>	<b>\$3,240</b>	<b>\$2,088</b>	<b>\$2,088</b>
Module 3 -- Total Fixed Costs (Nozzles)		\$0	\$0	\$0	\$2,088	\$2,088
Module 3 -- Total Fixed Costs (Dispensers)		\$3,240	\$3,240	\$3,240	\$0	\$0
Module 3 -- Annualized Costs = Fixed Costs (Nozzles) x CRF3		\$0	\$0	\$0	\$840	\$840
Module 3 -- Annualized Costs = Fixed Costs (Dispensers) x CRF2		\$666	\$666	\$666	\$0	\$0
<b>Module 3 -- Total Annualized Costs (All Equipment)</b>		<b>\$666</b>	<b>\$666</b>	<b>\$666</b>	<b>\$840</b>	<b>\$840</b>
		<b>Avg Fixed</b>	<b>\$2,779</b>	<b>Avg Annual</b>	<b>\$735</b>	

**Module 4 (Liquid Retention -- Redesigned Nozzle)**

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	\$54	9.75	9.75	9.75	9.75	9.75
<b>Module 4 -- Total Fixed Costs (Equipment Purchase + Installation)</b>		<b>\$527</b>	<b>\$527</b>	<b>\$527</b>	<b>\$527</b>	<b>\$527</b>
<b>Module 4 -- Annualized Costs = Fixed Costs x CRF3</b>		<b>\$212</b>	<b>\$212</b>	<b>\$212</b>	<b>\$212</b>	<b>\$212</b>
		<b>Avg Fixed</b>	<b>\$527</b>	<b>Avg Annual</b>	<b>\$212</b>	

**Module 5 (Spillage, including Dripless Nozzle)**

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	\$54	9.75	9.75	9.75	9.75	9.75
<b>Module 5 -- Total Fixed Costs (All Equipment)</b>		<b>\$527</b>	<b>\$527</b>	<b>\$527</b>	<b>\$527</b>	<b>\$527</b>
<b>Module 5 -- Annualized Costs = Fixed Costs x CRF3</b>		<b>\$212</b>	<b>\$212</b>	<b>\$212</b>	<b>\$212</b>	<b>\$212</b>
		<b>Avg Fixed</b>	<b>\$527</b>	<b>Avg Annual</b>	<b>\$212</b>	

**Module 6 (In-Station Diagnostics)**

Components		(OLD)						
Sensors -- Pressure	\$595	\$192	1.0	1.0	1.0	1.0	1.0	1.0
Sensors -- A/L	\$885	\$245	4.5	4.5	4.5	4.5	4.5	4.5
Datalogger w/EPROM & new CPU/motherboard	\$3,995	\$1,197	1.0	1.0	1.0	1.0	1.0	1.0
Dispenser interface	\$670		1.0	1.0	1.0	1.0	1.0	1.0
Inventory sensor (ATG)	\$1,095		2.5	2.5	2.5	2.5	2.5	2.5
Installation Costs: assume retrofit costs of \$300 base + \$200 per dispenser								
	\$1,200	\$1,280	4.5	4.5	4.5	4.5	4.5	4.5
<b>Module 6 -- Total Fixed Costs (All Equipment)</b>			\$13,180	\$13,180	\$13,180	\$13,180	\$13,180	\$13,180
Module 6 -- Annualized Costs = Total Fixed Costs x CRF1			\$2,145	\$2,145	\$2,145	\$2,145	\$2,145	\$2,145
Module 6 - Annualized maintenance/calib/repair			\$1,620	\$1,620	\$1,620	\$1,620	\$1,620	\$1,620
			Avg Fixed	\$13,180	Avg Annual		\$3,765	

Total Fixed Costs (All Modules)
Total Annualized Fixed Costs (All Modules)

\$41,515	\$41,515	\$43,917	\$38,425	\$38,214
\$8,165	\$8,165	\$8,733	\$7,933	\$7,878

Notes

Cost Recovery Factor CRF1 (10% discount, 10 yr. life) --	0.1627
Cost Recovery Factor CRF2 (10% discount, 7 yr. life) --	0.2054
Cost Recovery Factor CRF3 (10% discount, 3 yr. life) --	0.4021

Average Total Fixed Cost	\$40,717
Average Total Annualized Cost	\$8,175

\* from Healy Systems, 1999.

**Estimated Equipment Costs for a Model GDF 5 Facility per Proposed Module**

Proposed Module	Unit Cost 1999 Dollars	Number of Components in Model GDF				
		Bal-1	Bal-2	Hybrid	Assist-1	Assist-2
<b>Module 1 (Phase I)</b>						
Phase I Components						
Pressure/Vacuum (P/V) valve	\$65	2.5	2.5	2.5	2.5	2.5
Low-emission spill containment and cover	\$351	2.5	2.5	2.5	2.5	2.5
Drop tube & overflow protection	\$178	2.5	2.5	2.5	2.5	2.5
Rotatable adaptor	\$55	2.5	2.5	2.5	2.5	2.5
Installation Costs						
Pressure/Vacuum (P/V) Valve	\$80	2.5	2.5	2.5	2.5	2.5
Low-emission spill containment and cover	\$160	2.5	2.5	2.5	2.5	2.5
Drop tube & overflow protection	\$160	2.5	2.5	2.5	2.5	2.5
Rotatable adaptor	\$80	2.5	2.5	2.5	2.5	2.5
<b>Module 1 -- Total Fixed Cost (All Equipment)</b>		<b>\$2,823</b>	<b>\$2,823</b>	<b>\$2,823</b>	<b>\$2,823</b>	<b>\$2,823</b>
<b>Module 1 -- Total Annualized Cost = Total Fixed Cost x CRF2</b>		<b>\$580</b>	<b>\$580</b>	<b>\$580</b>	<b>\$580</b>	<b>\$580</b>
		<b>Avg Fixed</b>	<b>\$2,823</b>	<b>Avg Annual</b>	<b>\$580</b>	
<b>Module 2 (Phase II w/pressure-related fugitives)</b>						
Dispenser Components						
Nozzle -- Balance	\$200	16.3	16.25			
Nozzle -- Hybrid	\$231			16.25		
Nozzle -- Assist Type 1	\$209				16.25	
Nozzle -- Assist Type 2	\$225					16.25
Modified Equipment (Dispenser-related) -- Balance	\$382	16.25	16.25			
Modified Equipment (Dispenser-related) -- Hybrid	\$468			16.25		
Modified Equipment (Dispenser-related) -- Assist Type 1	\$400				16.25	
Modified Equipment (Dispenser-related) -- Assist Type 2	\$220					16.25
Auxiliary Items (incl. P/V, collection & processor)						
Assist Type 1	\$7,500				1.00	
Assist Type 2	\$9,000					1.00

Vapor processor							
for those Balance systems that use processors	\$7,500		1.00	1.00	1.00		
Installation Costs		(OLD)					
Nozzle -- Balance	\$172	\$86	16.25	16.25			
Nozzle -- Hybrid	\$215	\$108			16.25		
Nozzle -- Assist Type 1	\$97	\$48				16.25	
Nozzle -- Assist Type 2	\$108	\$54				16.25	
Modified Equipment (Dispenser-related) -- Balance	\$344	\$172	16.25	16.25			
Modified Equipment (Dispenser-related) -- Hybrid	\$430	\$215			16.25		
Modified Equipment (Dispenser-related) -- Assist Type 1	\$194	\$97				16.25	
Modified Equipment (Dispenser-related) -- Assist Type 2	\$215	\$108				16.25	
Auxilliary Items -- Assist Type 1	\$3,012	\$1,506			1.00		
Auxilliary Items -- Assist Type 2	\$2,581	\$1,291				1.00	
Vapor processor -- Balance	\$3,012	\$1,506	1.00	1.00	1.00		
<b>Module 2 -- Total Fixed Cost (All Equipment)</b>			<b>\$22,655</b>	<b>\$22,655</b>	<b>\$25,610</b>	<b>\$21,261</b>	<b>\$20,148</b>
Module 2 -- Total Fixed Cost (TFC Nozzles)			\$4,648	\$4,648	\$5,506	\$4,180	\$4,527
Module 2 -- Total Fixed Cost (TFC Dispensers)			\$9,001	\$9,001	\$11,099	\$8,075	\$5,331
Module 2 -- Total Fixed Cost (TFC All Other Equipment)			\$9,006	\$9,006	\$9,006	\$9,006	\$10,291
Module 2 -- Annualized Cost = Fixed Costs (TFC Nozzles) x CRF3			\$1,869	\$1,869	\$2,214	\$1,681	\$1,820
Module 2 -- Annualized Cost = Fixed Costs (TFC Dispensers) x CRF2			\$1,849	\$1,849	\$2,280	\$1,659	\$1,095
Module 2 -- Annualized Cost = Fixed Cost (TFC All Others) x CRF1			\$1,466	\$1,466	\$1,466	\$1,466	\$1,675
<b>Module 2 -- Total Annualized Costs (All Equipment)</b>			<b>\$5,184</b>	<b>\$5,184</b>	<b>\$5,959</b>	<b>\$4,805</b>	<b>\$4,590</b>
			<b>Avg Fixed</b>	<b>\$22,466</b>	<b>Avg Annual</b>		<b>\$5,144</b>

**Module 3 (ORVR Compatibility)**

Components						
Nozzle (Healy ORVR compatible drop-in assist nozzle)	\$54				16.25	16.25
Assumed 25% premium over Module 2-compliant nozzle (applies to assist only)						
Dispenser sensor & related electronics (Hoffer Flow Control)	\$200	12.00	12.00	12.00		
Installation Costs						
Nozzle (Healy ORVR compatible drop-in assist nozzle)*	\$160				16.25	16.25
Dispenser sensor & related electronics	\$160	12.00	12.00	12.00		
<b>Module 3 -- Total Fixed Costs (Equipment Purchase + Installation)</b>		<b>\$4,320</b>	<b>\$4,320</b>	<b>\$4,320</b>	<b>\$3,481</b>	<b>\$3,481</b>
Module 3 -- Total Fixed Costs (Nozzles)		\$0	\$0	\$0	\$3,481	\$3,481
Module 3 -- Total Fixed Costs (Dispensers)		\$4,320	\$4,320	\$4,320	\$0	\$0
Module 3 -- Annualized Costs = Fixed Costs (Nozzles) x CRF3		\$0	\$0	\$0	\$1,400	\$1,400
Module 3 -- Annualized Costs = Fixed Costs (Dispensers) x CRF2		\$887	\$887	\$887	\$0	\$0
<b>Module 3 -- Total Annualized Costs (All Equipment)</b>		<b>\$887</b>	<b>\$887</b>	<b>\$887</b>	<b>\$1,400</b>	<b>\$1,400</b>
		<b>Avg Fixed</b>	<b>\$3,984</b>	<b>Avg Annual</b>		<b>\$1,092</b>

**Module 4 (Liquid Retention -- Redesigned Nozzle)**

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	\$54	16.25	16.25	16.25	16.25	16.25
<b>Module 4 -- Total Fixed Costs (Equipment Purchase + Installation)</b>		<b>\$878</b>	<b>\$878</b>	<b>\$878</b>	<b>\$878</b>	<b>\$878</b>
<b>Module 4 -- Annualized Costs = Fixed Costs x CRF3</b>		<b>\$353</b>	<b>\$353</b>	<b>\$353</b>	<b>\$353</b>	<b>\$353</b>
		<b>Avg Fixed</b>	<b>\$878</b>	<b>Avg Annual</b>		<b>\$353</b>

**Module 5 (Spillage, including Dripless Nozzle)**

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	\$54	16.25	16.25	16.25	16.25	16.25
<b>Module 5 -- Total Fixed Costs (All Equipment)</b>		<b>\$878</b>	<b>\$878</b>	<b>\$878</b>	<b>\$878</b>	<b>\$878</b>
<b>Module 5 -- Annualized Costs = Fixed Costs x CRF3</b>		<b>\$353</b>	<b>\$353</b>	<b>\$353</b>	<b>\$353</b>	<b>\$353</b>
		<b>Avg Fixed</b>	<b>\$878</b>	<b>Avg Annual</b>		<b>\$353</b>

**Module 6 (In-Station Diagnostics)**

Components		(OLD)						
Sensors -- Pressure	\$595	\$192	1.00	1.00	1.00	1.00	1.00	1.00
Sensors -- A/L	\$885	\$245	6.00	6.00	6.00	6.00	6.00	6.00
Datalogger w/EPROM & new CPU/motherboard	\$3,995	\$1,197	1.00	1.00	1.00	1.00	1.00	1.00
Dispenser interface	\$670		1.0	1.0	1.0	1.0	1.0	1.0
Inventory sensor (ATG)	\$1,095		2.5	2.5	2.5	2.5	2.5	2.5
<b>Installation Costs: assume retrofit costs of \$300 base + \$200 per dispenser</b>								
Assumed 2 person-days/dispenser for ISD installation	\$1,500	\$1,280	6.0	6.00	6.00	6.00	6.00	6.00
<b>Module 6 -- Total Fixed Costs (All Equipment)</b>			\$14,808	\$14,808	\$14,808	\$14,808	\$14,808	\$14,808
<b>Module 6 -- Annualized Costs = Total Fixed Costs x CRF1</b>			\$2,410	\$2,410	\$2,410	\$2,410	\$2,410	\$2,410
<b>Module 6 - Annualized maintenance/calib/repair</b>			\$2,070	\$2,070	\$2,070	\$2,070	\$2,070	\$2,070
			Avg Fixed	\$14,808	Avg Annual		\$4,480	

<b>Total Fixed Costs (All Modules)</b>	\$46,362	\$46,362	\$49,317	\$44,128	\$43,016
<b>Total Annualized Fixed Costs (All Modules)</b>	\$9,767	\$9,767	\$10,543	\$9,901	\$9,686

Notes

Cost Recovery Factor CRF1 (10% discount, 10 yr. life) --	0.1627
Cost Recovery Factor CRF2 (10% discount, 7 yr. life) --	0.2054
Cost Recovery Factor CRF3 (10% discount, 3 yr. life) --	0.4021

Average Total Fixed Cost	\$45,837
Average Total Annualized Cost	\$9,933

\* from Healy Systems, 1999.

### Research & Development Costs for All Proposed Modules

Source	Unit Cost or Value
<b>Staff Costs</b>	
<b>Phase I systems</b>	
Engineering	
Assumed number of full-time engineers needed per certification	1
Annual cost per engineer (salary + benefits)	\$100,000
Number of years required per certification	1
Non-engineering	
Support staff needed per certification (assume 1 support per 2 engineers)	0.5
Annual cost per support staff (salary + benefits; assume 50% of engineer cost)	\$50,000
Number of years required per certification	1
<b>Total R&amp;D Staff Costs per Phase I certification</b>	<b>\$125,000</b>
<b>Phase II &amp; ISD systems</b>	
Engineering	
Assumed number of full-time engineers needed per certification	2
Annual cost per engineer (salary + benefits)	\$100,000
Number of years required per certification	2
Non-engineering	
Support staff needed per certification (assume 1 support per 2 engineers)	1
Annual cost per support staff (salary + benefits; assume 50% of engineer cost)	\$50,000
Number of years required per certification	2
<b>Total R&amp;D Staff Costs per Phase II and ISD Certification</b>	<b>\$500,000</b>
<b>Component &amp; Systems Development Costs (CSDC) per Certification</b>	
Design, prototype development, & commercialization cost per certification (assume 10% of total staff costs)	\$50,000
<b>Miscellaneous Costs</b>	
Marketing costs per certification (assumed 25% of CSDC)	\$12,500
<b>Total number of Phase II recertifications (as of 01/01/2000)</b>	<b>32</b>
<b>ISD systems to be developed &amp; certified (assume 25% of total Ph II recertifications)</b>	<b>8</b>
<b>Total number of Phase I recertifications (as of 01/01/2000)</b>	<b>14</b>
<b>Total Research &amp; Development Costs</b>	<b>\$25,125,000</b>
<b>Annualized R&amp;D Costs (CRF @ 10% discount rate, 5 yrs)</b>	<b>\$6,627,912</b>

### Certification and Testing Costs for All Proposed Modules

Source	Unit Cost or Value
<b>ARB Certification Fees</b>	
Typical current ARB fees per Phase II certification	\$10,000
Typical current ARB fees per Phase I certification	\$2,000
Multiplier for increase in test period (to 6 mos) & test matrix (to 200 cars)	5
Total number of recertifications	
Phase II	32
Phase I	14
Est. number of ISD certifications	8
<b>Total ARB Certification Fees (assume fee for ISD same as for Phase II)</b>	<b>\$2,140,000</b>
<b>Manufacturers' Certification Fees</b>	
Typical current Phase II cost per certification (site preparation, testing)	\$170,000
Typical current Phase I cost per certification (assume 20% of Phase II)	\$34,000
Multiplier for increase in test period (to 6 mos) & test matrix (to 200 cars)	2
Total number of Phase II recertifications	32
Est. number of new certifications (i.e., ISD systems or components)	8
Total number of Phase I recertifications	14
<b>Total Manufacturers' Phase I, Phase II, &amp; ISD Certification Costs</b>	<b>\$14,552,000</b>
<b>Total Certification (ARB + Manufacturers) Costs (over 4 years)</b>	<b>\$16,692,000</b>
<b>Annualized Certification Costs (CRF @ 10% discount rate, 4 yrs)</b>	<b>\$4,403,308</b>

**Notes:**

- (1) 4 yr annualization period for cost recovery factor (CRF) reflects proposed 4-yr cert. lifetimes
- (2) \$170,000 typical manuf. certification costs includes \$75,000 on-site + \$75,000 internal engineering and lab costs to prepare for field certification + \$20,000 for pressure monitoring.
- (3) Typical ARB certification fees taken from most recent ARB invoices for Phase I/II testing.

### GDF Population Distribution

National GDF Distribution in 1991	
Gal/mo	Percent of GDFs
3,000	3.80%
8,000	4.80%
17,500	15.00%
37,500	23.50%
75,000	32.30%
150,000	18.20%
300,000	2.40%

PWA (1991) = 70,661 gal/mo

Source: EPA, 1991  
 PWA = population-wtd average

Est. California Distribution in 1998	
Gal/mo	Percent of GDFs
3,000	0.76%
8,000	0.96%
17,500	3.00%
37,500	14.10%
75,000	45.65%
150,000	31.30%
300,000	4.22%

PWA (1998) = 99,779 gal/mo

Source: Staff adjustment of EPA, 1991 distribution to fit current average (pop-wtd avg = 99865)

## Ref. Source

- 1 "1999 State of the Industry Report," National Assoc. of Convenience Stores, <<http://www.cstorecentral.com/register/resource/resource/99soihighlights.html>>, visited on 01/03/00.  
Notes: (a) 1998 average motor fuel sold per store = 95,100 gals/month  
(b) Because of 1998's low fuel prices, the average margin cents per gallon dropped to 12.6 cents compared to 1997's 13.4 cents.
- 2 "EBW Vapor Recovery Equipment Price List," price list spreadsheet from EBW Web site, <<http://www.ebw.com/pricelist>>, visited on 01/03/00.  
Notes: (a) breakaways (avg = \$32.50 each)  
(b) drop tubes (avg = \$111 each, CARB approved)  
(c) P/V valves (avg = \$65 each, CARB approved)  
(d) EPROM + main CPU board (avg = \$725 each)  
(e) spill containment "bucket" with drain (avg = \$482 each)
- 3 "Model 800 Intelligent ORVR Nozzle," Powerpoint presentation by Healy Systems, <<http://www.healysystems.com/NozzlesandHoses/NozzlesandHoses.ppt>>, visited on 01/03/00.  
Notes: (a) "No excavation of downtime loss with Healy," Slide 14.  
(b) "No additional installation costs," Slide 14.  
(c) "Retrofit product: approximate installation time takes 2 workers one day per 4 multi-product dispenser station," Slide 14.
- 4 "Healy ORVR System," <<http://www.healysystems.com/orvr1.htm>>, visited on 01/13/00.  
Notes: (a) "...Healy Model 800 Nozzle converts your vacuum assist dispensers to ORVR with no added below-ground systems and no new electronics."  
(b) "...Healy Systems gives you the whole package in the nozzle."